SCHEME AND SYLLABUS FOR
B.E. (IT) - VII TO VIII SEMESTERS
UNDER
CHOICE BASED CREDIT SYSTEM

B.E. (INFORMATION TECHNOLOGY)

DEPARTMENT OF INFORMATION TECHNOLOGY
CHAITANYA BHARATHI INSTITUTE OF
TECHNOLOGY(A)
HYDERABAD-500 075

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)
Choice Based Credit System (with effect from 2019-20)
B.E. (Information Technology)

Semester– VII

S.No	Course Code	Title of the Course	Scheme of Instruction – Hours per Week L/T	Scheme of Instruction – Hours per Week P/D	Scheme of Examination – Duration of SEE in Hours	Scheme of Examination – Maximum Marks CIE	Scheme of Examination – Maximum Marks SEE	Credits
THEORY								
1	16IT C31	Embedded Systems and Internet of Things	3	-	3	30	70	3
2	16IT C32	Distributed Systems	3	-	3	30	70	3
3	16IT C33	Information Security	3	-	3	30	70	3
4	16IT C34	Big Data Analytics	3	-	3	30	70	3
5		Elective -IV	3	-	3	30	70	3
6		Elective -V	3	-	3	30	70	3
PRACTICALS								
7	16IT C35	Big Data Analytics Lab	-	3	3	25	50	2
8	16IT C36	Embedded Systems and IoT Lab	-	3	3	25	50	2
9	16IT C37	Project Seminar	-	3	-	50	-	2
		TOTAL	18	9	-	280	520	24

L: Lecture　T: Tutorial　D: Drawing　　P: Practical
CIE-Continuous Internal Evaluation　　SEE-Semester End Examination

Elective-IV		
S.No.	Subject Code	Subject Name
1.	16IT E10	Human Computer Interaction
2.	16IT E11	Soft Computing
3.	16IT E12	VLSI Technology

Elective -V		
S.No.	Subject Code	Subject Name
1.	16IT E13	Natural Language Processing
2.	16IT E14	Mobile Computing
3.	16IT E15	Business Intelligence

16ITC 31
EMBEDDED SYSTEMS AND INTERNET OF THINGS

Instruction	3L Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course is introduced to
1. Explore theoretical aspects of the design and development of an embedded system.
2. Provide an overview of basic concepts, structure and development of embedded systems using 8051.
3. Familiarize students with programming using 8051 and advanced processors.
4. Facilitate the Internet of Things, building blocks of IoT and the real world applications
5. Acuire knowledge of Raspberry Pi device, its interfaces and Django Framework.
6. Comprehend on domain specific applications of IoT.

Course Outcomes: After successful completion of this course, student will be able to
1. Acquire knowledge and skill in development of embedded systems.
2. Design and develop embedded systems using 8051.
3. Demonstrate real-time and advanced processor concepts.
4. Describe the role of things and Internet in IoT and determine the IoT levels for designing an IoT system.
5. Learn design methodology for IoT system design.
6. Describe about the Raspberry Pi board and interfacing sensors with Rasberry Pi and work with python based web application framework called Django.

Course Prerequisites: Digital Electronics and Logic Design (16ITC04), Computer Organization (16ITC11)

UNIT-I
Embedded Computing: Introduction, Complex Systems and Microprocessor, Embedded System Design Process. The 8051 Architecture: Introduction, 8051

Micro controller Hardware, Input/output Ports and Circuits, External Memory, Counter and Timers, Serial data Input/Output, Interrupts.

UNIT-II

Programming using 8051: Data Transfer and Logical Instructions, Arithmetic Operations, Decimal Arithmetic, Jump and Call Instructions, Applications: Interfacing with Keyboards, Displays, D/A and A/D Conversions, Multiple Interrupts, Introduction to advanced architectures: ARM and SHARC Processor and memory organization, Bus protocols, 12C bus and CAN bus.

UNIT-III

Introduction: Introduction to Internet of Things- Definitions & Characteristics of IoT, Physical Design of IoT-Things in IoT, IoT Protocols, Logical Design of IoT-IoT Functional Blocks, IoT Communication Models, IoT Communication APIs, IoT Enabling Technologies-Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems, IoT Levels& Deployment Templates.

UNIT-IV

IoT Platforms Design Methodology: Introduction, IoT Design Methodology Steps-Purpose and Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specifications, IoT Level Specification, Functional View Specification, Operational View Specification, Device and Component Integration, Application Development, Case Study on IoT System for Weather Monitoring. IoT Physical Devices and End Points: Basic building blocks of an IoT device, Raspberry Pi About the board, Raspberry Pi interfaces-Serial, SPI, I2C. Python Web Application Framework: Django Framework-Roles of Model, Template and View.

UNIT-V

Domain Specific IOTs: Various types of IoT Applications in Home Automation-smart lighting, Smart appliance, smoke and gas detectors, Cities, Environment, Energy, Retail, Logistics Agriculture, Industry, Health & Life Style-Wearable Electronics. IoT and M2M – Introduction, M2M, Differences between IoT and M2M, Software Defined Networking, Network Function Virtualization.

Text Books:
1. Wayne Wolf, "Computers as Components", 1st Edition, Academic press, 2001.
2. Kenneth J.Ayala, "The 8051 Microcontroller", 3rd Edition, Thomson, 2014.

3. Arshdeep Bahga, Vijay Madisetti, "Internet of Things: A Hands-on Approach", Universities Press, 2014.

Suggested Reading:
1. Raj Kamal, "Embedded Systems", 2nd Edition, McGraw Hill, 2015.
2. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.

Web Resources:
1. https://nptel.ac.in/noc/individual_course.php?id=noc17-cs05
2. www.win.tue.nl/~qingzhiliu/courses/IoT-Msc-2017/Slides/IoT-04-Architecture.pdf

16IT C32

DISTRIBUTED SYSTEMS

Instruction	3L Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course is introduced to
1. Present the basic concepts and principles of distributed systems.
2. Deal with the architectures and models of distributed systems.
3. Familiarize with concepts of processes, threads and various communication methods.
4. Familiarize with concepts of naming, directory services and synchronization in distributed environment.
5. Impart knowledge on the principles of consistency, replication and fault tolerance in distributed systems.
6. Provide understanding of various distributed object based systems.

Course Outcomes: Upon successful completion of the course, student will be able to
1. Describe the various models and architectures of distributed systems.
2. Illustrate use of threads in distributed systems.
3. Comprehend the distributed communication mechanisms.
4. Describe various naming and synchronization mechanism in distributed systems.
5. Analyse consistency, replication and fault tolerance in distributed systems.
6. Compare and contrast various distributed object-based systems.

Course Prerequisites:

Principles of Operating Systems (16ITC16), Computer Networks & Socket Programming (16ITC24)

UNIT – I

Introduction: Definition of A Distributed System; Goals- Making Resources Accessible, Distribution Transparency, Openness, Scalability; Types of Distributed Systems- Distributed Computing Systems, Distributed Information Systems, Distributed Pervasive Systems.

Architectures: Architectural Styles, System Architectures- Centralized Architectures, Decentralized Architectures, Hybrid Architectures; Architectures versus Middleware-Interceptors, General Approaches to Adaptive Software.

UNIT – II

Processes: Threads - Introduction to Threads, Threads in Distributed Systems; Virtualization - The Role of Virtualization In Distributed Systems, Architectures of Virtual Machines; Clients- Networked User Interfaces, Client-Side Software for Distribution Transparency; Servers- General Design Issues, Server Clusters, Managing Server Clusters; Code Migration- Approaches to Code Migration, Migration and Local Resources, Migration in Heterogeneous Systems.

Communication: Fundamentals- Layered Protocols, Types of Communication; Remote Procedure Call- Basic RPC Operation, Parameter Passing, Asynchronous RPC; Message-Oriented Communication- Message Oriented Transient Communication, Message Oriented Persistent Communication; Stream-Oriented Communication- Support for Continuous Media, Streams and Quality of Service, Stream Synchronization; Multicast Communication- Application-Level Multicasting, Gossip-Based Data Dissemination.

UNIT–II

Naming: Names, Identifiers, and Addresses; Flat Naming- Simple Solutions, Home-Based Approaches, Distributed Hash Tables, Hierarchical Approaches; Structured Naming- Name Spaces, Name Resolution, the Implementation of a Name Space; Attribute-based Naming- Directory Services, Hierarchical Implementations: LDAP, Decentralized Implementations.

Synchronization: Clock Synchronization- Physical Clocks, Global Positioning System, Clock Synchronization Algorithms; Logical Clocks- Lamport's Logical Clocks, Vector Clocks; Mutual Exclusion-Overview, A Centralized Algorithm, A Decentralized Algorithm, A Distributed Algorithm, A Token Ring Algorithm, A Comparison of the Four Algorithms; Global Positioning of Nodes; Election Algorithms- Traditional Election Algorithms, Elections in Wireless Environments, Elections in Large Scale Systems.

UNIT – IV

Consistency And Replication: Introduction- Reasons for Replication, Replication as Scaling Technique; Data-Centric Consistency Models- Continuous Consistency, Consistent Ordering of Operations; Client-Centric Consistency Models- Eventual Consistency, Monotonic Reads, Monotonic Writes, Read your Writes, Writes Follow Reads; Replica Management- Replica-Server Placement, Content Replication and Placement, Content Distribution; Consistency Protocols- Continuous Consistency, Primary-Based Protocols, Replicated-Write

Protocols, A Cache-Coherence Protocols, Implementing Client-Centric Consistency.

Fault Tolerance: Introduction To Fault Tolerance-Basic Concepts, Failure Models, Failure Masking by Redundancy; Process Resilience- Design Issues, Failure Masking and Replication, Agreement in Faulty Systems, Failure Detection; Reliable Client-Server Communication- Point-To-Point Communication, RPC Semantics in The Presence Of Failures; Reliable Group Communication- Basic Reliable-Multicasting Schemes, Scalability in Reliable Multicasting, Atomic Multicast; Distributed Commit-Two-Phase Commit, Three-Phase Commit; Recovery- Introduction, Checkpointing, Message Logging, Recovery-Oriented Computing.

UNIT – V
Distributed Object-Based Systems: Architecture- Distributed Objects, Example: Enterprise Java Beans, Example- Globe Distributed Shared Objects; Processes-Object Servers, Example: The Ice Runtime System; Communication- Binding a Client to an Object, Static versus Dynamic Remote Method Invocations, Parameter Passing, Example: Java RMI, Object-Based Messaging; Naming-CORBA Object References, Globe Object References; Synchronization, Consistency and Replication- Entry Consistency, Replicated Invocations; Fault Tolerance- Example: Fault-Tolerant CORBA, Example: Fault-Tolerant Java; Security- Example: GLOBE, Security for Remote Objects.

Text Books:
1. Andrew S. Tanenbaum and Van Steen "Distributed Systems: Principles and Paradigms", PHI, 2nd Edition, 2014.
2. Colouris G., Dollimore Jean and Kindberg Tim, "Distributed Systems Concepts and Design", Pearson education, 5th Edition, 2012.

Suggested Reading:
1. Sunitha Mahajan, Seema Shah, "Distributed Computing", Oxford University Press, 2nd Edition, 2013.
2. S.Ghosh, Chapman & Hall/CRC, "Distributed Systems", Taylor & Francis Group, 2010.
3. Ajay D. Kshemakalyani, MukeshSinghal, "Distributed Computing, Principles, Algorithms and Systems", Cambridge, 2010.

Web Resource:
1. https://nptel.ac.in/courses/106106168/

16IT C33

INFORMATION SECURITY

Instruction	3L Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course is introduced to
1. Provide basic concepts of Information security and threats its associated attacks.
2. Deal with legal, ethical, professional issues and the role of risk management.
3. Impart knowledge about Information security planning and technology.
4. Facilitate learning of cryptographic algorithms.
5. Acquaint with physical access and oversight of environmental controls.
6. Provide how security policy affects the ongoing technical and administrative evaluation.

Course Outcomes: Upon successful completion of this course, student will be able to:
1. Identify threats that cause harm to assets.
2. Implement laws, ethics that avoids violations in security.
3. Understand security planning and technology.
4. Implement cryptography algorithms to provide security.
5. Understand security issues and the corresponding solutions.
6. Implement information security,employment policies and practices.

Course Prerequisites: Data Communications (16IT C09)

UNIT – I
Introduction to Information Security: History of Information Security, What Is Security,CNSS security model,Components of an Information System, Balancing Information Security and Access, Approaches to Information Security Implementation, Security in the Systems Life Cycle, Security Professionals and the Organization.
Need for Security: Business needs, Threats and Attacks, Compromises to Intellectual Property, Deviations in Quality of Service, Espionage or Trespass,

Forces of Nature, Human Error or Failure, Information Extortion, Sabotage or Vandalism, Software Attacks, Technical Hardware Failure or Errors,Technical Software Failure or Errors, Technological Obsolescence, Theft.

UNIT – II

Legal, Ethical and Professional Issues in Information Security: Introduction, Law and Ethics in Information Security, Relevant U.S Laws, International Laws and Legal Bodies,Ethics and Information Security, Codes of Ethics at Professional Organization, Key U.S.Federal Agencies.

Risk management: An Overview of Risk Management, Risk Identification, Risk assessment, Risk Control, Quantatitive versus Qualitative Risk Management Practices, Recommended Risk Control Practices.

UNIT – III

Planning for Security: Introduction, Information Security Planning and Governance, Information Security Policy, Standards and Practices, the Information Security Blue Print, Security Education, Training and Awareness Program, Continuity Strategies.

Security Technology: Introduction, Access Control, Firewalls, Intrusion detection and prevention systems, Honey pots,Honey nets, Padded Cell Systems, Scanning and Analysis Tools.

UNIT – IV

Cryptography: Introduction, Foundations of Cryptology, Cipher methods, cryptographic Algorithms Cryptographic Tools, Protocols for Secure Communications.

Physical Security: Introduction,Physical Access Controls,Fire Security and Safety,Failure of Supporting Utilities and Structural Collapse, Interception of Data,Securing Mobile and Portable Systems,Special Considerations for Physical Security

UNIT – V

Implementing Information Security: Introduction, Information Security Project Management, TechnicalAspects of Implementation, Non technical Aspects of Implementation, Information Systems Security Certification and Accreditation.

Security and Personnel: Introduction,Positioning and Staffing Security Function, Employment Policies and Practices, Security Considerations for Temporary Employees, Consultants and Other Workers, Internal Control Strategies, Privacy and the Security of Personnel Data

Information security Maintenance: Introduction, Security Management Maintenance Models, Digital Forensics.

Text Books:
1. Michael E. Whitman, Hebert J Mattord, "Principles of Information Security", 5th Edition, Cengage Learning, 2014.
2. Thomas R Peltier, Justing Peltier, JohnBlackley, "Information Security Fundamentals", Auerbacj Publications, 2010.
3. William Stallings "Cryptography and Network Security Principles and Practice", 6th Edition, Pearson, 2014.

Suggested Reading:
1. Dr.V.K.Jain,"Cryptography and Network Security", 1st Edition, Khanna Book publishing, 2013.
2. Marks Merkow, Jim Breithaupt, "Information Security: Principle and Practices", 2nd Edition, Pearson Education, 2014.

Web Resources:
1. https://www.sans.org/security-resources/
2. https://nptel.ac.in/courses/106106129/

16IT C34

BIG DATA ANALYTICS

Instruction	3L Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course is introduced to
1. To explain the importance of big data, role of Hadoop framework in analyzing large datasets.
2. To gain knowledge of writing mapper and reducer for a given problem.
3. To provide the concepts of NoSQL databases and the working mechanisms of MongoDB.
4. To familiarize writing queries in Pig and Hive to process big data.
5. To discuss the concept and writing applications using Spark
6. To acquaint with Scala Programming constructs

Course Outcomes: Upon successful completion of the course, student will be able to
1. Understand processing large datasets in Hadoop framework.
2. Develop applications using MapReduce framework to solve real world problems.
3. Develop data models using MongoDB.
4. Develop scripts using Pig to process large datasets and understand querying using hive from a data warehouse.
5. Understand the fundamentals of the Spark and expertise in using Resilient Distributed Datasets (RDD) for creating applications in Spark.
6. Develop functional programs using Scala.

Course Prerequisites: Java Programming (16ITC10), Python Programming (16ITE01)

UNIT – I
Introduction to Big Data: Importance of Big Data, when to considerBig Data as a solution, Big Data use cases: IT for IT Log Analytics, the Fraud Detection Pattern, and Social Media Pattern.
The Hadoop Distributed Files system: The Design of HDFS, HDFS Concepts, Blocks, Name nodes and Data nodes, Block Caching, HDFS Federation, HDFS

High Availability, The Command-Line Interface, Basic File system Operations, Hadoop File systems, Interfaces, The Java Interface, Reading Data from a Hadoop URL, Reading Data Using the File System API, Writing Data, Directories, Querying the File system, Deleting Data, Data Flow, Anatomy of a File Read, Anatomy of a File Write.

UNIT – II
MapReduce: What is Map reduce, Architecture of map reduce.**How MapReduce Works**: Anatomy of a MapReduce Job Run, Job Submission, Job Initialization, Task Assignment, Task Execution, Progress and Status Updates, Job Completion, Failures, Task Failure, Application Master Failure, Node Manager Failure, Resource Manager Failure, Shuffle and Sort, The Map Side, The Reduce Side, MapReduce Types and Formats: MapReduce Types, The Default MapReduce Job, Input Formats,Input Splits and Records, Text Input, Output Formats, Text Output.
Developing MapReduce Applications on contemporary problems.

UNIT – III
No SQL Databases: Review of traditional Databases, Need for NoSQL Databases, Columnar Databases, Failover and reliability principles, CAP Theorem, Differences between SQL and NoSQL databases.
Working mechanisms of Mongo DB: Overview, Advantages, Environment, Data Modeling, Create Database, Drop Database, Create collection, Drop collection, Data types, Insert, Query, Update and Delete operations, Limiting and Sorting records, Indexing, Aggregation.

UNIT – IV
Pig: Installing and Running Pig, an Example, Generating Examples, Comparison with Databases, Pig Latin, User-Defined Functions, Data Processing Operators, Pig in Practice.
Hive: Installing Hive, The Hive Shell, An Example, Running Hive, Comparison with Traditional Databases, HiveQL, Tables, Querying Data, User-Defined Functions, Writing a User Defined Functions, Writing a User Defined Aggregate Function.

UNIT – V
Spark: Importance of Spark Framework, Components of the Spark unified stack, Batch and Real-Time Analytics with Apache Spark, Resilient Distributed Dataset (RDD), SCALA (Object Oriented and Functional Programming)**Scala**: Scala Environment Set up, Downloading and installing Spark standalone, Functional Programming, Collections.

Text Books:
1. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'Reilly Media Inc, 2015.
2. Tanmay Deshpande, "Hadoop Real-World Solutions Cookbook", 2nd Edition, Packt Publishing, 2016.

Suggested Reading:
1. Thilinagunarathne,"Hadoop MapReduce v2 Cookbook", 2ndEdition, Packet Publishing, 2015.
2. Chuck Lam, Mark Davis, AjitGaddam, "Hadoop in Action", Manning Publications Company, 2016.
3. Alan Gates, "Programming Pig", O'Reilly Media Inc, 2011.

Web Resources:
1. http://www.planetcassandra.org/what-is-nosql
2. http://www.iitr.ac.in/media/facspace/patelfec/16Bit/index.html
3. https://class.coursera.org/datasci-001/lecture
4. http://bigdatauniversity.com

16IT E10

HUMAN COMPUTER INTERACTION
(Elective - IV)

Instruction	3L Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course objectives: This Course is introduced to
1. Present the characteristics of graphical and web user interface, design and system menus.
2. Facilitate learning of different kinds of windows, device based and screen based controls.
3. Familiarize with feedback, internationalization, color, graphics, images and icons.
4. Impart knowledge about prototype modelling for an interactive product.
5. Impart knowledge about the structure and the representational dynamics of the cognitive system interacting with the computer.
6. Discuss interaction design and evaluation framework.

Course Outcomes: Upon successful completion of the course, student will be able to
1. Comprehend the characteristics of Graphical and web user interface, design and system menus.
2. Choose proper kinds of windows, device based and screen based controls.
3. Understand feedback, internationalization, color, graphics, images and icons.
4. Describe prototype modelling methods.
5. Demonstrate an understanding of principles, and theories influencing human computer interaction.
6. Understand the role of text, sound and touch in interaction design.

Course Prerequisites: IT Workshop (18ITC08)

UNIT – I
The Importance of the User Interface: Defining the User Interface, The Importance of Good Design, **Characteristics of Graphical and Web User Interfaces:** The

Graphical User Interface, The Web User Interface: Characteristics of a Web Interface, **Principles of User Interface Design:** General Principles.
The User Interface Design Process: Obstacles and Pitfalls in the Development Path, Usability, the Design Team, **Know Your User or Client:** Understanding How People Interact with Computers, Important Human Characteristics in Design, Human Considerations in Design, Human Interaction Speeds, Methods for Gaining an Understanding of Users, **Understand the Principles of Good Screen Design:** Human Considerations in Screen Design, **Develop System Menus and Navigation Schemes:** Structures of Menus, Functions of Menus, Content of Menus, Formatting of Menus, Phrasing the Menu, Selecting Menu Choices, Kinds of Graphical Menus

UNIT – II
Select the Proper Kinds of Windows: Window Characteristics, Components of a Window, Window Presentation Styles, Types of Windows, Window Management, Organizing Window Functions, Window Operations, **Select the Proper Device-Based Controls:** Characteristics of Device-Based Controls, **Choose the**
Proper Screen-Based Controls: Operable Controls, Text Entry/Read-Only Controls, Combination Entry/Selection Controls, Other Operable Controls, Presentation Controls, Selecting the Proper Controls, **Write Clear Text and Messages.**

UNIT – III
Provide Effective Feedback, Guidance and Assistance, Provide Effective Internationalization and Accessibility, Create Meaningful Graphics, Icons and Images, Choose the Proper Colors, Organize and Layout Windows and Pages.

UNIT – IV
Interaction Design – Introduction, Goals of Interaction Design, Heuristics and Usability principles, **Conceptualizing interaction:** Problem Space, conceptual models, interface metaphors, paradigms. **Understanding Users**: cognition, Conceptual frame works for cognition, **Collaboration and Communication:** Social mechanisms, Conceptual frameworks.

UNIT – V
Understanding how interfaces affect users: Affective aspects, Expressive interfaces, User frustration, Agents, **Process of Interaction Design:** What is interaction design about? Life cycle models, **Design, prototyping and**
Construction: Prototyping and construction, Conceptual Design, Physical Design, **Introducing Evaluation:** Introduction, What, Why and when to evaluate, **Evaluation Framework, Testing and modeling users.**

Text Books:
1.   Wilbert O. Galitz, "The essential guide to User Interface Design", Wiley Dreamtech, 2002.
2.   Sharp, Rogers, Preece, "Interaction Design", 2nd Edition, John Wiley, 2008
3.   Steven Heim, "The Resonant Interface: HCI Foundations for Interaction Design", Addison-Wesley, 2007.

Suggested Reading:
1.   J. Preece, Y. Rogers, and H. Sharp, "Interaction Design: Beyond Human-Computer Interaction", Wiley & Sons, 2nd Edition, 2007.
2.   Ben Shneiderman,Catherine Plaisant, "Designing the User Interface: Strategies for Effective Human-Computer Interaction", 5th Edition, Addison-Wesley, 2009.

Web Resources:
1.   http://openclassroom.stanford.edu/MainFolder CoursePage.php?course=HCI
2.   http://hcibib.org/hci-sites/history
3.   http://www.hcirn.com/tutor/index.php

16IT E11

SOFT COMPUTING
(Elective -IV)

Instruction	3L Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course is introduced to
1. Familiarize with Artificial neural networks.
2. Discuss Memory networks.
3. Give insights into supervised and unsupervised learning.
4. Present Fuzzy sets, fuzzy relations and membership functions.
5. Familiarize with defuzzification, fuzzy measures and reasoning.
6. Facilitate learning concepts of Genetic algorithm and its applications.

Course Outcomes: Upon successful completion of the course, student will be able to
1. Understand Artificial Neural Networks.
2. Understand architectures and training of memory networks.
3. Describe various supervised and unsupervised networks.
4. Comprehend fuzzy sets, relation and membership functions to handle engineering problems
5. Understand the process of defuzzification.
6. Perform various operations of genetic algorithms.

Course Prerequisites: Data Warehousing and Data Mining (16ITC25)

UNIT–I
Artificial Neural Networks: Fundamental concepts, Evolution of neural networks, basic model of Artificial neural networks, Important terminology of ANNs, McCulloch-pitts neuron model, Linear separability, Hebb Network **Supervised Learning Network:** Perceptron networks, adaptive linear neuron (Adaline), Multiple adaptive linear neuron, Back propagation network,Radial basis Function network .

UNIT–II
Associative Memory Networks: Training algorithms for pattern Association, Associative memory network, Heteroassociative memory network: theory, architecture, Bidirectional Associative Memory: architecture, Discrete Bidirectional associative memory, Continuous BAM, Analysis of hamming distance, Energy function and storage capacity, Hopfield networks: Discrete Hopfield network, continuous Hopfield network. **Unsupervised Learning Networks:** Fixed Weight Competitive Nets, Kohonen Self-Organizing Feature Maps: architecture, training algorithm, Learning Vector Quantization: architecture, training algorithm, Adaptive Resonance Theory Network: theory, ART 1. **Special Networks:** Simulated Annealing Networks, Boltzmann machine, Gaussian machine

UNIT–III
Introduction to Fuzzy Logic, classical sets and fuzzy sets: Introduction to Fuzzy logic, Classical sets: Operations on classical sets, properties, Fuzzy sets: Operations, Properties. **Classical Relations and Fuzzy Relations:** Fuzzy relations, Tolerance and Equivalence relations, **Membership Functions:** Fuzzification, Membership value assignments: Inference, rank ordering, angular fuzzy sets.

UNIT–IV
Defuzzification: Lamda Cuts for fuzzy sets and fuzzy relations, defuzzification methods, **Fuzzy Arithmetic and Fuzzy Measures:** Fuzzy arithmetic, Extension principle, Fuzzy measures, Measures of fuzziness, Fuzzy integrals, **Fuzzy Rule Base and Approximate Reasoning:** Truth values and tables in fuzzy logic, Fuzzy propositions, Formation of rules, Decomposition of compound rules, Aggregation of fuzzy rules, Fuzzy reasoning, Fuzzy inference system, Overview of fuzzy expert system.

UNIT–V
Fuzzy Decision Making: Individual Decision Making, Multiperson, multi objective, multi attribute, Fuzzy Bayesian decision making, **Genetic Algorithm:** Introduction, basic terminology, Genetic algorithm vs Traditional algorithm, simple GA, general genetic algorithm, Operators in GA, Stopping condition, Constraints, Schema theorem, Classification of genetic algorithm, Holland classifier systems, genetic programming, applications of genetic algorithm

Text Book:
1. S. N. Sivanandam & S.N.Deepa, "Principles of Soft Computing", Wiley India, 2nd Edition, 2011.

Suggested Reading:
1. Limin Fu, "Neural Networks in Computer Intelligence", McGraw Hill, 1995.
2. Timoty J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill, 1997
3. N.P. Padhy, S.P. Simon, "Soft Computing: With Matlab Programming", Oxford University Press, Academic, 2015
4. J.S.R. Jang, C.T. Sun, E.Mizutani, "Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence", Prentice Hall India, 1997.

Web Resources:
1. https://onlinecourses.nptel.ac.in/noc18_cs13/preview
2. https://www.tutorialspoint.com/artificial_intelligence artificial_intelligence_neural_networks.htm

16IT E12

VLSI TECHNOLOGY
(Elective -IV)

Instruction	3L Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course is introduced to
1. Provide the fundamentals of CMOS circuits, to understand basic electrical properties of MOS circuits.
2. Explore VLSI Design Flow and Transistor-Level CMOS Logic Design
3. Familiarize with VLSI Fabrication and CMOS Physical Design.
4. Aquiant with the design of advanced CMOS circuits.
5. Facilitate design aspects of Primary (semiconductor) memory concepts.
6. Familiarize with hardware description language.

Course Outcomes: Upon successful completion of this course, student will be able to
1. Use circuit analysis models in analysis of CMOS digital electronics circuits, including logic components and their interconnections.
2. Create models of moderately sized CMOS circuits that realize specified digital functions.
3. Know the Fabrication process of a chip.
4. Apply CMOS technology-specific layout rules in the placement, routing of transistors.
5. Understand CMOS circuit design using HDL.
6. Complete a significant VLSI design project by applying specified design constraints.

Course Prerequisites: Basic Electronics (16EC C01), Digital Electronics and Logic Design(16IT C04).

UNIT – I
An overview of VLSI, Moore's law, Electrical Conduction in Silicon, Electrical Characteristics of MOSFETs Threshold voltage, n-FET Current-Voltage equations, square law and linear model of a FET, MOS capacitances, gate-source and gate drain capacitances, junction capacitances in a MOSFET, RC model of

a FET, Modeling small MOSFET, scaling. MOSFET as switches, pass characteristics, logic gates using CMOS, Bubble pushing, XOR and XNOR gates, AOI and OAI logic gates, transmission gates. TG based 2-to-1 MUX, XOR, XNOR, OR circuits.

UNIT – II

Physical structure of CMOS ICs, IC layers, layers used to create a MOSFET, Top and side view of MOSFETs, Silicon patterning or layouts for series and parallel connected FETs. Layouts of NOT gate, transmission gate, non-inverting buffer, NAND2, NOR2, Complex logic gate, 4 input AOI gate. Stick diagram representations. Layouts of Basic Structure: nwells, active area definition, design of n+, p + regions, masks for the n-FET, active contact cross section and mask set, metal1 line with active contact, poly contact: cross section and layout, Vias and higher level metals, Latchup prevention.

UNIT – III

Fabrication of CMOS ICs, CMOS process flow, Design rules: minimum space width, minimum spacing, surround, extension, cell concepts and cell based design, logic gates as basic cells, creation of new cell using basic gates. DC characteristics of the CMOS inverter symmetrical inverter, layouts, Inverter switching characteristics, RC switch model equivalent for the CMOS inverter, rise time and fall time calculation.

UNIT – IV

Pseudo n-MOS, tri-state inverter circuits, clocked CMOS, charge leakage, Dynamic CMOS logic circuits, pre-charge and evaluation charge sharing, Domino logic, Dual rail logic networks, differential Cascade Voltage Switch Logic (CVSL) AND/NAND, OR/NOR gates, The SRAM, 6T SRAM cell design parameters, writing to an SRAM, SRAM arrays, Dynamic RAMs: 1T RAM cell, charge leakage and refresh in a DRAM cell, ROM array using pseudo n-MOS circuitry, floating gate MOSFET, effect of charge storage on the floating gate.

UNIT – V

VLSI Design flow, structural gate level modeling, gate primitives, gate delays, switch level modeling, behavioural and RTL operators, timing controls, blocking and non blocking assignments, conditional statements, Data flow modeling and RTL, Arithmetic circuits; half adder, full adder, ripple carry adders, carry look ahead adders, High speed adders, multipliers. Interconnect modeling; Interconnect resistance and capacitance sheet resistance Rs,single and multiple rung ladder circuits, cross talk, floor planning and routing, clocking, Testing of VLSI circuits.

Text Books:
1. John P. Uyemura, "Introduction to VLSI circuits and Systems", John Wiley & Sons, 2002.
2. Douglas A. Pucknell, Kamran Eshraghian, "Basic VLSI Design" 3rd Edition, PHI, 2000.

Suggested Reading:
1. John P. Uyemura, "Chip design for submicron VLSI: CMOS layout and simulation" IE, Cengage learning, 2006.
2. Jan M. Rabey and others "Digital Integrated Circuits A design perspective", Pearson Education, 2003.
3. Kamran Eshraghian, Douglas A. Pucknell, and Sholeh Eshraghian, "Essentials of VLSI circuits and systems", PHI, 2011.

Web Resources:
1. http://www.chwa.com.tw/fea/4kCgy2008610090733 2008610090733LF0RE2KZBA.pdf
2. http://nptel.ac.in/courses/117101058/downloads/Lec-2.pdf
3. https://slideplayer.com/slide/7713916/

16IT E13

NATURAL LANGUAGE PROCESSING
(Elective -V)

Instruction	3L Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course introduces
1. Theoretical concepts of language processing that shows how to explore interesting bodies of text.
2. Fundamental topics in language processing that include tagging, classification, and information extractionusing tiny Python programs.
3. Formal grammar to describe the structure of an unlimited set of sentences.
4. Methods to parse a sentence, recognize its syntactic structure and construct representations of meaning.
5. Effective management of linguistic data.
6. Design of existing corpora, the typical workflow forcreating a corpus and the life cycle of a corpus.

Course Outcomes: Upon successful completion of this course, student will be able to
1. Comprehend the concept of natural language processing, its challenges and applications.
2. Demonstrate skills in natural language processing using the Python programming language and the Natural Language Toolkit (NLTK) open source library.
3. Extract information from unstructured text, either to guess the topic or identify "named entities".
4. Analyze linguistic structure in text, including parsing and semantic analysis.
5. Access popular linguistic databases, including WordNet and treebanks.
6. Integrate techniques drawn from fields as diverse as linguistics and artificial intelligence.

Course Prerequisites: Python Programming (16ITE01)

UNIT–I
Language Processing: Computing with Language- Texts and Words, A Closer Look at Python: Texts as Lists of Words, Computing with Language- Simple Statistics, Automatic Natural Language Understanding, **Accessing Text Corpora and Lexical Resources**: Accessing Text Corpora, Conditional Frequency Distributions, Lexical Resources, Word Net

UNIT–II
Processing Raw Text: Strings- Text Processing at the Lowest Level, Text Processing with Unicode, Regular Expressions for Detecting Word Patterns, Useful Applications of Regular Expressions, Normalizing Text, Regular Expressions for Tokenizing Text, Segmentation, Formatting: From Lists to Strings **Categorizing and Tagging Words:** Mapping Words to Properties Using Python Dictionaries, Automatic Tagging, N-Gram Tagging, Transformation-Based Tagging

UNIT–III
Learning to Classify Text: Supervised Classification, Evaluation, Modeling Linguistic Patterns, **Extracting Information from Text**: Information, Chunking, Developing and Evaluating Chunkers Recursion in Linguistic Structure .

UNIT–IV
Analyzing Sentence Structure: Context-Free Grammar, Parsing with Context-Free Grammar,Dependencies and Dependency Grammar, Grammar Development **Building Feature-Based Grammars:** Grammatical Features,Processing Feature Structures,Extending a Feature-Based Grammar

UNIT–V
Analyzing the Meaning of Sentences: Natural Language Understanding, Propositional Logic, First-Order Logic, the Semantics of English Sentences. **Managing Linguistic Data: Corpus** Structure: A Case Study, the Life Cycle of a Corpus, Acquiring Data.

Text Book:
1. Steven Bird, Evan Klein, Edward Loper, "Natural Language Processing with Python", O'Reilly Media, Inc., 2009.

Suggested Reading:
1. Daniel Jurafsky, James H Martin. "Speech and Language Processing", 2nd Edition, Pearson Education, 2009.
2. Nitin Indurkhya, Fred J. Damerau, "Handbook of Natural Language Processing", 2nd Edition, Chapman and Hall/CRC Press, 2010.
3. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.
4. Nitin Hardaniya, Jacob Perkins, "Natural Language Processing: Python and NLTK", Packt Publishers, 2016.

Web Resources:
1. https://pythonprogramming.net/tokenizing-words-sentences-nltk-tutorial/
2. http://www.nptelvideos.in/2012/11/natural-language-processing.html
3. https://github.com/keon/awesome-nlp

16IT E14

MOBILE COMPUTING
(Elective -V)

Instruction	3L Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course is introduced to
1. Familiarize with Cellular concepts and medium access mechanisms for wireless systems.
2. Deal with features of a range of mobile devices and systems.
3. Facilitate understanding of Network layer functions for mobile systems.
4. Acquaint with functions of transport layers for mobile communication systems.
5. Provide understanding of database hoarding techniques, data dissemination techniques.
6. Impart knowledge on Data Synchronization techniques for mobile computing systems.

Course Outcomes: Upon successful completion of this course, student will be able to
1. Discuss the cellular concepts, techniques for improving cellular system capacity and medium access control.
2. Describe the features of a wide variety of mobile devices and systems.
3. Understand Mobile IP, packet delivery and Dynamic Host Configuration Protocol
4. Analyze different variations of TCP for mobile communication systems.
5. Describe database hoarding and data dissemination techniques.
6. Elaborate the rules for Data Synchronization in mobile computing systems.

Course Prerequisites: Computer Networks and Socket Programming (16ITC24)

UNIT–I
Introduction: Challenges in mobile computing, Coping with uncertainties, resource poorness, bandwidth, etc. Cellular architecture, Co-channel interference, Frequency reuse, Capacity increase by cell splitting.

Medium Access Control: Motivation for a specialized MAC: Hidden and Exposed terminals. Near and Far terminals; SDMA, FDMA, TDMA: Fixed TDM, Classical Aloha, Slotted Aloha, Carrier sense multiple access, Demand assigned multiple access, PRMA packet reservation multiple access, Reservation TDMA, Multiple access with collision avoidance, Polling, Inhibit sense multiple access; CDMA: Spread Aloha multiple access.

UNIT–II
Mobile Devices And Systems-Features of Mobile Smart Phones,Digital Music Players, Hand-held Pocket Computers, Operating Systems of Hand-held Devices and their features, Smart Systems- Smart cards, Smart labels, RFID, Smart Tokens, Sensors and Actuators, Set-top Boxes,Limitations of Mobile Devices,Automotive Systems.
GSM: Mobile services, System architecture, Localization, Call Handling, Handover, Security, New data services, Features of HSPA 3G Network, HSPA+, Long Term Evolution (LTE), WiMax and 4G LTE Advanced and WiMax 802.16m Networks.

UNIT–III
Mobile Network Layer: Mobile IP: Goals, assumptions and requirements, Entities and Terminology, IP packet delivery, Agent advertisement and discovery, Registration, Tunneling and Encapsulation, Optimizations, Reverse tunneling, Ipv6; Dynamic host configuration protocol.

UNIT–V
Mobile Transport Layer : Traditional TCP: Congestion control, Slow start, Fast retransmit/fast recovery, Implications on mobility; Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission/timeout freezing, Selective retransmission, Transaction oriented TCP.

UNIT–V
Databases and Mobile Computing: Data Hoarding Techniques, Data Caching-Cache Invalidation Mechanisms, Data Cache Maintenance and Web Cache Maintenance in Mobile Environments, Power-aware Mobile Computing, Context-aware Computing.
Data Dissemination: Communication Asymmetry, Classification of Data Delivery mechanisms: Push-based mechanisms, Pull-based mechanisms, Hybrid mechanisms.
Data Synchronization: Synchronization in Mobile Computing Systems, Usage Models for Synchronization, Domain-dependent Specific rules for Data Synchronization, Personal Information Manager (PIM), Synchronization and Conflict resolution strategies, Synchronizer.

Text Books:
1. Jochen, M Schiller, "Mobile Communications", 2nd Edition Pearson Education, India, 2012.
2. Raj Kamal, "Mobile Computing", 2nd Edition, Oxford University Press, 2013.

Suggested Reading:
1. Reza B, "Mobile Computing Principles", Cambridge University press, 2005.
2. Frank Adelstein, S.K.S. Gupta, Golden G. Richard III, Loren Schwiebert, "Fundamentals of Mobile and Pervasive Computing", McGraw-Hill Professional Publication.
3. KurnkumGarg, "Mobile Computing", Pearson Education, 2010.
4. K. Pahlavan, P. Krishnamurthy, "Principles of Wireless Networks", Prentice Hall.
5. D.P. Agrawal, Q.A. Zeng, "Introduction to Wireless and Mobile Systems", Thomson Brooks/Cole.

Web Resource:
1. https://onlinecourses.nptel.ac.in/noc16_cs13/preview

16IT E15

BUSINESS INTELLIGENCE
(Elective -V)

Instruction   3L Hours per week
Duration of End Examination   3 Hours
Semester End Examination   70 Marks
CIE   30 Marks
Credits   3

Course Objectives: This course is introduced to
1. Focus on designing and building a business intelligent system.
2. Acquaint with advanced database techniques.
3. Acquire and understand mathematical concepts to develop data centric decision models.
4. Design and develop data Warehouse using Various Schema and Dimensional modelling.
5. Design data architectures.
6. Familiarize with differentreport generating techniques.

Course Outcomes: After successful completion of this course, student will be able to
1. Gain knowledge in the theory, principles and applications of business intelligent system.
2. Design and implement OLTP, OLAP and Warehouse concepts.
3. Design a data model and use relevant techniques for data analysis
4. Use Analytics concepts like data mining, Exploratory and statistical techniques for predictive analysis in Business Intelligence.
5. Represent different data Architectures.
6. Build Business Intelligence reports.

Course Prerequisites: Database Systems (16ITC17), Data Warehousing and Data Mining (16ITC25)

UNIT–I
Business Intelligence And Its Impact : Introduction, Information Pyramid – Data, Information, Knowledge, What is Business Intelligence,Factors Driving Business Intelligence,Business Intelligence And Related Technologies, Business Intelligence in Contemporary Organizations,Obstacles To Business Intelligence.

UNIT–II
Business Intelligence Capabilities: Four Synergic Capabilities, Organizational Memory,Information Integration, Insight Creation,Presentation.
Technologies Enabling Organizational Memory: Data Warehouse: ER Modeling,

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Dimensional Modeling, Designing Enterprise Architecture, Knowledge Repositories.

UNIT–III
Representation of Data in Data Warehouse: Dimensional Modelling:The STAR and SNOWFLAKE schema, Pros & Cons of the STAR/SNOWFLAKE Schema.
Technologies Enabling Presentation: Online Analytical Processing(OLAP), Online Transaction Processing(OLTP**),** OLAP Versus OLTP, Impact Of Business Intelligence On Corporate Performance,
The Central Repository – Meta data, Information Consumption User Interfaces – Desktop Vs. Web Vs. Mobile, Open Architecture, Scalability, Performance in BI – In Memory Analytics.

UNIT—V
BI Project Life cycle: Typical BI Project Life cycle, Requirements Gathering & Analysis – Functional & Non Functional Requirements, Reports & Dashboards Design – Mock-up and Story boarding, testing in a BI Project, BI Project Deployment, and Post Production Support.

UNIT–V
Introduction to Enterprise Class: BI Tool First Level of Abstraction of the Data Warehouse in Micro Strategy, **Building the Schema Objects** – Attributes, Facts, Transformation & Hierarchies, **Building Reusable Application Objects** – Metrics, Filters, Prompts, Five Styles of BI, Building Reports – Grids & Graphs, Report Manipulation over the Web – Pivoting, Sorting, Drilling, Exporting etc., Setting up Report Distribution, Report Project.

Text Books:
1. Sabherwal R. and Becerra-Fernandez I., "Business Intelligence", Wiley.
2. R. Sharda, D. Delen, E. Turban, "Business Intelligence and Analytics: Systems for Decision Support", 10th Edition, Pearson/Prentice Hall.

Suggested Reading:
1. Kimball R., Ross M., "The Kimball Group Reader: Relentlessly Practical Tools for Data Warehousing and Business Intelligence", Wiley and Sons, 2010.
2. Carlo Vercellis, "Business Intelligence: Data Mining and Optimization for Decision Making", Wiley Publications, 2009.
3. Jim Mazzullo,"SAP R/3 for Everyone", Pearson, 2007.

Web Resources:
1. http://www.teradatamagazine.com/v13n01/Features/A-Better-Data-Plan/ (accessed September 2013).
2. https://www.youtube.com results?search_query=Business+Analytic+and+intelligence
3. https://www.youtube.com results?search_query=Business+Analytic+and+intelligence+IIT

16IT C35

BIG DATA ANALYTICS LAB

Instruction	3P Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives: This course is introduced to
1. Provide the knowledge to setup a Hadoop Cluster.
2. Impart knowledge to develop programs using MapReduce.
3. Discuss Pig, PigLatin and HiveQL to process big data.
4. Familiarize with NoSQL databases.
5. Presentlatest big data frameworks and applications using Spark and Scala.
6. IntegrateHadoop with R (RHadoop) to process and visualize.

Course Outcomes: Upon successful completion of this course, student will be able to
1. Understand Hadoop working environment.
2. Work with big data applications in multi node clusters.
3. Apply big data and echo system techniques for real world problems.
4. Write scripts using Pig to solve real world problems.
5. Write queries using Hive to analyze the datasets
6. Understand spark working environment.

Course Prerequisites: Java Programming (16ITC10), Python Programming (16ITE01)

List of Programs
1. Understanding and using basic HDFS commands
2. Word count application using Mapper Reducer on single node cluster
3. Analysis of Weather Dataset on Multi node Cluster using Hadoop
4. Real world case studies on Map Reduce applications
5. Working with files in Hadoop file system: Reading, Writing and Copying
6. Writing User Defined Functions/Eval functions for filtering unwanted data in Pig
7. Working with Hive QL

8. Writing User Defined Functions in Hive
9. Understanding the processing of large dataset on Spark framework.
10. Integrating Hadoop with other data analytic framework like R

Text Books:
1. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'Reilly Inc, 2015.
2. Tanmay Deshpande, "Hadoop Real-World Solutions Cookbook", 2nd Edition, Packt Publishing, 2016.

Suggested Reading:
1. Edward Capriolo, Dean Wampler, and Jason Rutherglen, "Programming Hive", O'Reilly Inc, 2012.
2. VigneshPrajapati, "Big data Analytics with R and Hadoop", Packt Publishing, 2013.

Web Resources:
1. https://parthgoelblog.wordpress.com/tag/hadoop-installation
2. http://www.iitr.ac.in/media/facspace/patelfec/16Bit/index.html
3. https://class.coursera.org/datasci-001/lecture
4. http://bigdatauniversity.com

16IT C36

EMBEDDED SYSTEMS AND IOT LAB

Instruction	3P Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives: This course is introduced to
1. Familiarize withinterfacing LEDs and switches using 8051 Microcontroller.
2. Aquaint with interface controls using 8051.
3. Explore design and development of an embedded system
4. Know the interfacing programs using Python.
5. Understand the applications using Raspberry Pi3.
6. Provide necessary knowledge to develop working code for real-world IoT applications.

Course Outcomes: Upon successful completion of this course, student will be able to
1. Possess the passion for acquiring programming skills in using different tools.
2. Able to design and develop embedded systems (hardware, peripherals and firmware).
3. Write code for different forms of interfacing devices.
4. Develop python programs that run on Raspberry Pi3
5. Interface Sensors and Actuators with Raspberry Pi3
6. Develop simple IoT systems using Raspberry Pi3 device and appropriate sensors and Django Framework.

Course Prerequisites: Microprocessors (16ITC11) and Python Programming (16ITE01).

List of Experiments
A. Use of 8-bit and 32-bit Microcontrollers, (such as 8051 Microcontroller, ARM2148 / ARM2378, LPC 2141/42/44/46/48) and C compiler (Keil, Ride etc.) to:
   1. Interface Input-Output and other units such as: Relays, LEDs, LCDs, Switches, Keypads, Stepper Motors, and ADCs.

   2. Develop Control Applications such as: Temperature Controller, Elevator Controller, Traffic Controller
B. Internet of Things (IoT) Experiments

Following are some of the programs that a student should be able to write and test on Raspberry Pi
   1. Switching LED on/off from Raspberry Pi Console.
   2. Interfacing an LED and Switch with Raspberry Pi.
   3. Interfacing a Light Sensor with Raspberry Pi.
   4. Interfacing Rain Sensing Automatic Wiper System.
   5. Interfacing to identify accident and send alert messages.
   6. Interfacing smoke sensor to give alert message to fire department.
   7. Implementation of Traffic Light System based on density, to decrease congestion.
   8. Design and develop IoT Solar Power Monitoring System.
   9. Design and develop Patient health monitoring system.
   10. Implementation of Home Automation System using WiFi Module.

Text Books:
1. Kenneth J.Ayala, "The 8051 Microcontroller", 3rd Edition, Thomson, 2014.
2. ArshdeepBahga, Vijay Madisetti, "Internet of Things: A Hands-on Approach", Universities Press, 2014.

Suggested Reading:
1. Raj Kamal, "Embedded Systems", 2nd Edition, McGraw Hill, 2015.
2. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1stEdition, Academic Press, 2014.
3. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.

Web Resources:
1. https://www.edgefx.in/8051-microcontroller-architecture/
2. http://www.circuitbasics.com/raspberry-pi-ds18b20-temperature-sensor-tutorial/
3. https://raspberrypihq.com/making-a-led-blink-using-the-raspberry-pi-and-python/

16IT C37

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PROJECT SEMINAR

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Instruction	3P Hours per week
CIE	50 Marks
Credits	2

　　　　The objective of 'Project Seminar' is to enable the student take up investigative study in the broad field of Engineering / Technology, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a supervisor. This is expected to provide a good initiation for the student(s) towards R&D. The work shall include:

1. Survey and study of published literature on the assigned topic;
2. Working out a preliminary Approach to the Problem relating to the assigned topic;
3. Conducting preliminary Analysis/Modelling/Simulation/Experiment/ Design/Feasibility;
4. Preparing a Written Report on the Study conducted for Presentation to the Department;
5. Final Seminar, as oral Presentation before a departmental Committee.

Guidelines for the award of Marks:

Max. Marks: 50

Evaluation by	Max .Marks	Evaluation Criteria / Parameter
Supervisor	20	Project Status / Review
	5	Report
Department Committee	5	Relevance of the Topic
	5	PPT Preparation
	5	Presentation
	5	Question and Answers
	5	Report Preparation

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)
Choice Based Credit System (with effect from 2019-20)
B.E. (Information Technology)

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Semester– VIII

S.No	Course Code	Title of the Course	Scheme of Instruction Hours per Week L/T	Scheme of Instruction Hours per Week P/D	Duration of SEE in Hours	Maximum Marks CIE	Maximum Marks SEE	Credits
		THEORY						
1		Elective-VI	3	-	3	30	70	3
2		Open Elective-I	3	-	3	30	70	3
3		Open Elective-II	3	-	3	30	70	3
4	16ITC 38	Seminar	3	-	-	50	-	2
5	16ITC 39	Project	-	6	Viva-Voce	50	100	6
		TOTAL	12	6	-	190	310	17

L: Lecture　T: Tutorial　D: Drawing　　P: Practical
CIE-Continuous Internal Evaluation　　　SEE-Semester End Examination

Elective-VI		
S.No.	**Subject Code**	**Subject Name**
1.	16ITE 16	Virtual Reality
2.	16ITE 17	Social Media Analytics
3.	16ITE 18	Cloud Computing

Open Elective-I		
S.No.	**Subject Code**	**Subject Name**
1.	16MEO 02	Robotics
2.	16MEO 04	Intellectual Property Rights
3.	16MEO 06	Research Methodologies
4.	16MEO 07	Introduction to Operations Research

Open Elective-II		
S.No.	**Subject Code**	**Subject Name**
1.	16MEO 01	Entrepreneurship
2.	16MEO 03	Human Rights and Legislature Procedures
3.	16CEO 02	Disaster Mitigation and Management
4.	16EGO 02	Gender Sensitization

16IT E16

VIRTUAL REALITY
(Elective -VI)

Instruction	3L Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course is introduced to
1. Familiarize with fundamentals of Virtual Reality.
2. Deal with the behavior of light in lenses and human vision.
3. Facilitatepreliminaries of visual perception on spectrum of light and visual rendering.
4. Impart the knowledge of tracking 2D and 3D orientation.
5. Demonstrate the physics of sound and use of Haptics.
6. Familiarize with evaluation of Virtual Reality Systems.

Course Outcomes: After successful completion of this course, student will be able to:
1. Understand goals of VR and the geometry involved in Virtual world.
2. Understand optical aberrations of light and relates the Cornea of human eye to Photoreceptors which implies the eye movement.
3. Identify depth, motion, color of Visual perception and use it for Visual rendering.
4. Apply knowledge of tracking 2D and 3D orientation for tracking position and orientation of the attached bodies.
5. Understand perception and rendering of audio system in Virtual Reality and analyze the haptic devices and interfaces.
6. Understand perceptual training and evaluate experiments on Human subjects related to VR Systems.

Course Prerequisites: Mathematics-III (16MTC05), Engineering Graphics (16MEC02)

UNIT–I
Introduction to Virtual Reality(VR): Goals and VR definitions, Historical perspective, Birds-eye view (general), Birds-eye view: hardware, software, sensation and perception.
The Geometry of Virtual Worlds: Geometric Models,Changing Position and Orientation, Axis-Angle Representations of Rotation, Viewing Transformations, Chaining the Transformations.

UNIT–II
Light and Optics: Basic Behavior of Light, Lenses, Optical Aberrations, The Human Eye, Cameras.
The Physiology of Human Vision: From the Cornea to Photoreceptors, From Photoreceptors to the Visual Cortex, Eye Movements, Implications for VR.

UNIT–III
Visual Perception: Perception of Depth, Perception of Motion, Perception of Color, Combining Sources of Information.
Visual Rendering: Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions, Improving Latency and Frame Rates, Immersive Photos and Videos.

UNIT–V
Tracking: Tracking 2D Orientation, Tracking 3D Orientation, Tracking Position and Orientation, Tracking Attached Bodies, 3D Scanning of Environments
Audio: The physics of sound, The Physiology of Human Hearing, Auditory Perception, Auditory Rendering.

UNIT–V
Haptics: Introduction to Haptics, Branches of Haptics, Human haptics-Tactile system, Kinesthetic system, motor system, Haptic Devices and Interfaces – Kinesthetic devices, Haptic Devices and Interfaces –Tactic devices.
Evaluating VR Systems Experiences: Perceptual Training, Recommendations for Developers, Comfort and VR Sickness, Experiments on Human Subjects.

Text Books:
1. Steve Lavalle, "Virtual Reality", Cambridge University Press, 2017.
2. Nathaniel I. Durlach and Anne S. Mavor, "Virtual Reality: Scientific and Technological Challenges" National Academy Press Washington, D.C.,1995.

Suggested Reading:
1. John Vince, "Virtual Reality Systems ", Pearson Education Asia, 2007.
2. George Mather, "Foundations of Sensation and Perception: Psychology", 2nd Edition, 2009.
3. Kelly S. Hale, Kay M. Stanney, "Handbook of Virtual Environments: Design, Implementation, and Applications", CRC Press, 2014.

Web Resources:
1. https://nptel.ac.in/courses/121106013/
2. https://nptel.ac.in/syllabus/106106138/

16IT E17

SOCIAL MEDIA ANALYTICS
(Elective -VI)

Instruction	3L Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course is introduced to
1. Present basics of Social media mining and challenges in mining social media data.
2. Discuss graph essentials, network essentials and network models for social media mining.
3. Deal with the process of detecting, analyzing communities and Information diffusion in the context of Social media analytics.
4. Impart knowledge about mining essentials and importance of influence and homophily.
5. Discuss recommendation systems in the context of social media.
6. Present the working of prediction systems.

Course Outcomes: Upon completing this course, students will be able to:
1. Understand and analyze the challenges posed by social media data.
2. Represent social media using a suitable network model.
3. Perform community analysis and analyze herd behavior.
4. Model, measure and distinguish between influence and homophily.
5. Understand and build recommendation systems.
6. Understand how a prediction system works.

UNIT–I
Introduction: Social Media Mining, New Challenges for Mining.
Graph Essentials: Graph Basics, Graph Representation, Types of Graphs, Connectivity in Graphs, Special Graphs, Graph Algorithms,
Network Measures: Centrality, Transitivity and Reciprocity, Balance and Status, Similarity, Network Models: Properties of Real-World Networks, Random Graphs, Small-World Model, Preferential Attachment Model.

UNIT–II
Community Analysis: Community Detection, Community Evolution, Community Evaluation, Information**Diffusion in Social Media:** Herd Behaviour, Information Cascades, Diffusion of Innovations, Epidemics.

UNIT–III
Data Mining Essentials: Data, Data Preprocessing, Data Mining Algorithms, Supervised Learning, Unsupervised Learning,
Influence and Homophily: Measuring Assortativity, Influence, Homophily, Distinguishing Influence and Homophily.

UNIT–V
Recommendation in Social Media: Challenges, Classical Recommendation Algorithms, Recommendation Using Social Context, Evaluating Recommendations, Behavior Analytics: Individual Behavior, Collective Behavior.

UNIT–V
Prediction: Predicting the future, Prediction of learning, Predicting elections, Predicting Box offices, Predicting Stock market, Closing predictions.

Text Books:
1. Zafarani R., Abbasi M.A., Liu H, "Social Media Mining: An Introduction", Cambridge University Press, 2014.
2. Lutz Finger, Soumitra Dutta, "Ask, Measure, Learn: Using Social Media Analytics to Understand and Influence Customer Behavior", O'Reilly Media, 2014.

Suggested Reading:
1. David Easley and Jon Kleinberg, "Networks, Crowds and Markets", Cambridge University Press, 2010
2. Bing Liu, "Sentiment Analysis: mining opinions, sentiments, and emotions", Cambridge University Press, 2015.
3. Matthew A. Russell, "Mining the Social Web: Analyzing Data from Facebook, Twitter, LinkedIn, and Other Social Media Sites", O'Reilly Media 2011.

Web Resources:
1. http://www.kdd.org/kdd2015/tutorial.html
2. http://thinktostart.com/category/social-media/
   http://blogs.iit.edu/iit_web/social-media-2/social-media-whats-your-strategy/4

16IT E18

CLOUD COMPUTING
(Elective -VI)

Instruction	3L Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course is introduced to
1. Familiarize with basic concepts of cloud computing and enabling technologies.
2. Discuss Auto-Scaling, capacity planning and load balancing in cloud.
3. Impart knowledge on issues related to security, privacy and compliance.
4. Cloud management standards and programming models.
5. Deal with the basics of Service oriented architecture.
6. Gain knowledge on databases in cloud.

Course Outcomes: After successful completion of the course, student will be able to
1. Understand the basic concepts of different cloud computing and its techniques.
2. Learn the issues related to scaling and load balancing.
3. Identify the security and compliance issues in clouds.
4. Analyze Portability and Interoperability issues and cloud virtualization.
5. Understand the importance of SOA.
6. Learn the importance of databases in cloud.

Course prerequisites: Principles of Operating Systems(16ITC16)

UNIT–I
Introduction-Limitations of the Traditional Computing Approaches, Three Layers of Computing, Three Layers in Traditional Computing, The End of Traditional Computing, Influences behind Cloud Service Adoption. Benefits and challenges: Origin of the Term 'Cloud Computing', Early Initiatives, Utility Computing, Metering and Billing in Cloud, Separation of Data Center Operation, Benefits of Cloud Computing, Challenges of Cloud Computing, How Cloud Computing Addresses Business Challenges, Ethical Issues in Cloud Computing, Cloud

Computing: Network as Computer, Role of Web Service, Role of API, Ubiquitous Cloud, Confusion Between Cloud and Internet.Cloud computing services, Resource Virtualization, Resource pooling, sharing and provisioning.

UNIT–II
Scaling in cloud-Introduction to Scaling, Scaling in Traditional Computing, Scaling in Cloud Computing, Foundation of Cloud Scaling, Scalable Application, Scaling Strategies in Cloud, Auto-Scaling in Cloud, Types of Scaling, Performance and Scalability, the Resource Contention Problem , Cloud Bursting: A Scenario of Flexible Scaling, Scalability is a Business Concern, **Capacity Planning**-Capacity Planning, Capacity Planning in Computing, Capacity Planning in Cloud Computing, Approaches for Maintaining Sufficient Capacity, Steps for Capacity Planning, **Load Balancing**- Load Balancing, Importance of Load Balancing in Cloud Computing, Load Balancing in Cloud, Goals of Load Balancing, Categories of Load Balancing, Load Balancing Algorithms, Case study on Google cloud and Amazon Elastic Compute Cloud (EC2), File System and Storage.

UNIT–III
Content Delivery Network: CDN Service Operations, Evolution of CDN, Advantages of CDN, Disadvantages of CDN, CDN Service Provider, Security Reference Model, **Security Issues**- Cloud security, threats to Cloud Security, Infrastructure Security, Information Security, Identity Management and Access Control, Cloud Security Design Principles, Cloud Security Management Frameworks, Security-as-a-Service, Privacy and Compliance Issues.

UNIT–IV
Portability and Interoperability Issues- Challenges in the Cloud, The Issues in Traditional Computing, Addressing Portability and Interoperability in Cloud, Portability and Interoperability Scenarios, Machine Imaging or Virtual Machine Image, Virtual Appliance, Difference between Virtual Machine Image and Virtual Appliance, Open Virtualization Format (OVF), Cloud Management and a Programming Model Case Study, Popular Cloud Services.

UNIT– V
Service-Oriented Architecture:The Pre-SOA Era ,Role of SOA in Cloud Computing, Service-Oriented Architecture, Goal of System Designing, Service Represents Business Functionality, Open Standard Implementation, Beneits of SOA, SOA and Cloud Computing. **Enterprise architecture and SOA**: Enterprise Software, Enterprise Custom Applications,Workflow and Business Processes, Enterprise Analytics and Search, Enterprise Cloud Computing Ecosystem.

Text Books:
1. Sandeep Bhowmik, "Cloud Computing", Cambridge University Press, 2017.
2. Gautam Shroff, "Enterprise Cloud Computing - Technology, Architecture, Applications", Cambridge University Press, 2016.

Suggested Reading:
1. Kai Hwang, Geoffrey C.Fox, Jack J.Dongarra, "Distributed and Cloud Computing from Parallel Processing to the Internet of Things", Elsevier, 2012.
2. Barrie Sosinsky" Cloud Computing Bible", Wiley-India, 2010.
3. Ronald L. Krutz, Russell Dean Vines "Cloud Security: A Comprehensive Guide to Secure Cloud Computing", Wiley- India,2010.

Web Resource:
1. https://nptel.ac.in/coursesnptel_download.php?subjectid=106105167

16ME O02

ROBOTICS
(Open Elective - I)

Instruction	3L Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: Students will understand
1. The configuration, work envelop and motion controls and applications
2. The kinematics and dynamics of robots.
3. Robot end effectors and their design.
4. Robot Programming Languages and Programming methods of robot.
5. Various Sensors and drives and their applications in robots

Course Outcomes: At the end of the course, the students will be
1. Equipped with the knowledge of robot anatomy, work volume and robot applications
2. Familiarized with the kinematic motions of robot and robot dynamics
3. Having good knowledge about robot end effectors and their design concepts
4. Equipped with the Programming methods & drives used in robots
5. Equipped with the principles of various Sensors and their applications in robots.

UNIT–I
Introduction to Robotics: History and evolution of robots, basic configuration, degree of freedom, work envelope, motion control methods. Various applications in industry: material handling, loading & unloading, processing, welding & painting, assembly and inspection. Requirements and Specifications of Robots.

UNIT–II
Rigid Motions and Homogeneous Transformations: Rotation matrix, Homogenous transformation matrix, Denavit-Hartenberg convention, Euler angles, RPY representation, Direct and inverse kinematics for industrial robots for position and orientation.

UNIT—II
Velocity Kinematics – The Manipulator Jacobian: Joint, End effector velocity, direct and inverse velocity analysis. **Trajectory Planning**, interpolation, cubic

polynomial, linear segments with parabolic blending, static force and moment transformation, solvability, stiffness, singularities.

UNIT-IV

Robot Dynamics: Lagrangian formulation, link inertia tensor and manipulator inertia tensor. **Newton**-Euler formulation for RR & RP manipulators.**Control**: Individual joint, computed torque.

UNIT-V

End Effectors: Position and velocity measurement, **Sensors**: Proximity and range, tactile, force and torque, Drives for Robots: Electrical, Hydraulic and Pneumatic. **Robot Vision**: Introduction to technique, image acquisition and processing, introduction to robot programming languages.

Text Books:
1. Spong and Vidyasagar, "Robot Dynamics and Control", John Wile and Sons, 1990
2. R.K. Mittal, I.J. Nagrath, "Robotics and control", Tata Mcgraw-Hill Publishing Company Ltd. 2003
3. Groover, "Industrial Robotics", Mcgraw-Hill Publishing Company Ltd. 2003

Suggested Reading:
1. Asada and Slotine, "Robot analysis and Intelligence", Wiley Interscience, 1986.
2. K.S. Fu Gon ZalezRC., lEEc.S.G., "Robotics, Control Sensing Vision and Intelligence", McGraw Hill, Int. Ed., 1987
3. Richard S. Paul, "Robot Manipulators: Mathematics, Programming, and Control", MIT Press

16ME O04

INTELLECTUAL PROPERTY RIGHTS
(Open Elective - I)

Instruction	3L Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: Student will learn
1. Fundamental aspects of IP
2. Aspects of IPR acts.
3. Awareness of multi disciplinary audience
4. Awareness for innovation and its importance
5. The changes in IPR culture and techno-business aspects of IPR

Course Outcomes: At the end of the course, a student
1. Will respect intellectual property of others
2. Learn the art of understanding IPR
3. Develop the capability of searching the stage of innovations.
4. Will be capable of filing a patent document independently.
5. Completely understand the techno-legal business angle of IPR and converting creativity into IPR and effectively protect it.

UNIT–I

Overview of Intellectual Property: Introduction and the need for intellectual property right (IPR), IPR in India – Genesis and Development, IPR abroad, Some important examples of IPR. Importance of WTO, TRIPS agreement, International Conventions and PCT

Patents: Macro economic impact of the patent system, Patent and kind of inventions protected by a patent, Patent document, How to protect your inventions. Granting of patent, Rights of a patent, how extensive is patent protection. Why protect inventions by patents. Searching a patent, Drafting of a patent, Filing of a patent, the different layers of the international patent system, (national, regional and international options), compulsory licensing and licensers of right & revocation, Utility models, Differences between a utility model and a patent. Trade secrets and know-how agreements

UNIT–I
Industrial Designs: What is an industrial design. How can industrial designs be protected? What kind of protection is provided by industrial designs? How long does the protection last? Why protect industrial designs?

UNIT–III
Trademarks: What is a trademark, Rights of trademark? What kind of signs can be used as trademarks. Types of trademark, function does a trademark perform, How is a trademark protected? How is a trademark registered. How long is a registered trademark protected for? How extensive is trademark protection. What are well-known marks and how are they protected? Domain name and how does it relate to trademarks? Trademark infringement and passing off.

UNIT–IV
Copyright: What is copyright. What is covered by copyright. How long does copyright last? Why protect copyright? Related Rights: what are related rights.Distinction between related rights and copyright. Rights covered by copyright? Copy rights in computer programming.

UNIT–V
Enforcement of Intellectual Property Rights: Infringement of intellectual property rights Enforcement Measures Emerging issues in Intellectual property protection. Case studies of patents and IP Protection.
Unfair Competition: What is unfair competition.Relationship between unfair competition and intellectual property laws.

Text Books:
1. Ajit Parulekar and Sarita D' Souza, "Indian Patents Law – Legal & Business Implications", Macmillan India ltd , 2006.
2. B. L.Wadehra; "Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications", Universal law Publishing Pvt. Ltd., India 2000.
3. P. Narayanan, "Law of Copyright and Industrial Designs", Eastern law House, Delhi 2010.

Suggested Reading:
1. W.R1 Cronish, "Intellectual Property; Patents, copyright, Trad and Allied rights", Sweet & Maxwell, 1993.
2. P. Narayanan, "Intellectual Property Law", Eastern Law Edition, 1997.
3. Robin Jacob and Daniel Alexander, "A Guide Book to Intellectual Property Patents, Trademarks, Copy rights and designs", 4th Edition, Sweet, Maxwell.

16ME O06

RESEARCH METHODOLOGIES
(Open Elective - I)

Instruction	3L Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To make the students to formulate the research problem
2. To identify various sources for literature review and data collection.
3. To prepare the research design
4. To equip the students with good methods to analyze the collected data
5. To explain how to interpret the results and report writing

Course Outcomes: At the end of the course, the students are able to
1. Define research problem
2. Review and asses the quality of literature from various sources.
3. Understand and develop various research designs.
4. Analyze problem by statistical techniques: ANOVA, F-test, Chi-square
5. Improve the style and format of writing a report for technical paper/ Journal report

UNIT–I
Research Methodology: Objectives and Motivation of Research, Types of Research- Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical, Research Approaches, Significance of Research, Research Methods verses Methodology, Research process, Criteria of Good Research, Problems Encountered by Researchers in India, Technique involved in defining a problem.

UNIT–I
Literature Survey: Importance of Literature Survey, Sources of Information- primary, secondary, tertiary, Assessment of Quality of Journals and Articles, Information through Internet.

UNIT–III
Research Design: Meaning of Research Design, Need of Research Design, Feature of a Good Design Important Concepts Related to Research Design,

Different Research Designs, Basic Principles of Experimental Design, Steps in sample design

UNIT-IV
Data Collection: Collection of primary data, Secondary data, Measures of central tendency-mean, mode, median, Measures of dispersion- Range, Mean deviation, Standard deviation, Measures of asymmetry (skewness), Important parametric tests -z, t, F, Chi-Square, ANOVA significance

UNIT-V
Research Report Writing: Format of the Research report, Synopsis, Dissertation, Thesis its Differentiation, References/Bibliography/Webliography, Technical paper writing/Journal report writing, making presentation, Use of visual aids. Research Proposal Preparation- Writing a Research Proposal and Research Report, Writing Research Grant Proposal.

Text Books:
1. C.R Kothari, "Research Methodology, Methods & Technique", New Age International Publishers, 2004.
2. R. Ganesan, "Research Methodology for Engineers", MJP Publishers, 2011.

Suggested Reading:
1. Vijay Upagade and Aravind Shende, "Research Methodology", S. Chand & Company Ltd., New Delhi, 2009.
2. G. Nageswara Rao, "Research Methodology and Quantitative methods", BS Publications, Hyderabad, 2012.
3. Ratan Khananabis and Suvasis Saha, "Research Methodology", Universities Press, Hyderabad, 2015.

16ME O07

INTRODUCTION TO OPERATIONS RESEARCH
(Open Elective - I)

Instruction	3L Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. Students will come to know the formulation of LPP models.
2. Students will understand the Algorithms of Graphical and Simplex Methods.
3. Students will understand the Transportation and Assignment techniques.
4. Students will come to know the procedure of Project Management along with CPM and PERT techniques.
5. Students will understand the concepts of sequencing.

Course Outcomes: At the end of the course, the students were able to
1. Formulate a managerial decision problem into a mathematical model.
2. Apply transportation problems in manufacturing industries.
3. Build and solve assignment models.
4. Apply project management techniques like CPM and PERT to plan and execute project successfully.
5. Apply sequencing concepts in industry applications.

UNIT–I
Introduction: Definition and Scope of Operations Research.
Linear Programming: Introduction, Formulation of linear programming problems, graphical method of solving LP problem, simplex method

UNIT–II
Transportation Models: Finding an initial feasible solution - North West Corner Method, Least Cost Method, Vogel's Approximation Method, Finding the optimal solution, Unbalanced Transportation problem, Degeneracy in Transportation,

UNIT–II
Assignment Techniques: Introduction, Hungarian technique of Assignment techniques, unbalanced problems, problems with restrictions, Maximization in Assignment problems.

UNIT-IV

Project Management: Definition, Procedure and Objectives of Project Management, Differences between PERT and CPM, Rules for drawing Network diagram, Scheduling the activities, Fulkerson's rule, Earliest and Latest times, Determination of critical path, duration of the project

UNIT-V

Sequencing Models: Introduction, General assumptions, processing 'n' jobs through two machines, processing 'n' jobs through three machines.

Text Books:
1. Hamdy, A. Taha, "Operations Research-An Introduction", Prentice Hall of India Pvt. Ltd., 6th Edition, 1997.
2. S.D. Sharma, "Operations Research", Kedarnath, Ramnath & Co., Meerut, 2009.
3. V.K. Kapoor, "Operations Research", S. Chand Publishers, New Delhi, 2004.

Suggested Reading:
1. Harvey M. Wagner, "Principles of Operations Research", 2nd Edition, Prentice Hall of India Ltd., 1980.
2. R. Paneer Selvam, "Operations Research", Second Edition, PHI Learning Pvt. Ltd., New Delhi, 2008
3. Nita H. Shah, Ravi M. Gor, Hardik Soni, "Operations Research", PHI Learning Private Limited, 2013

16ME O01

ENTREPRENEURSHIP
(Open Elective - II)

Instruction	3L Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: Student will understand
1. The environment of industry and related opportunities and challenges
2. Concept and procedure of idea generation
3. Elements of business plan and its procedure
4. Project management and its techniques
5. Behavioral issues and Time management

Course Outcomes: After completing this course, students will be able to:
1. Identify opportunities and deciding nature of industry
2. Brainstorm ideas for new and innovative products or services
3. Analyze the feasibility of a new business plan and preparation of Business plan
4. Use project management techniques like PERT and CPM
5. Analyze behavioural aspects and use time management matrix

UNIT–I

Indian Industrial Environment: Competence, Opportunities and Challenges, Entrepreneurship and Economic growth, Small Scale Industry in India, Objectives, Linkage among small, medium and heavy industries, Types of enterprises, Corporate Social Responsibility.

UNIT–II

Identification and Characteristics of Entrepreneurs: First generation entrepreneurs, environmental influence and women entrepreneurs, Conception and evaluation of ideas and their sources, Selection of Technology, Collaborative interaction for Technology development.

UNIT–III

Business Plan: Introduction, Elements of Business Plan and its salient features, Technical Analysis, Profitability and Financial Analysis, Marketing Analysis, Feasibility studies, Executive Summary.

UNIT–V

Project Management: During construction phase, project organization, project planning and control using CPM, PERT techniques, Human aspects of project management, Assessment of tax burden

UNIT–V

Behavioral Aspects of Entrepreneurs: Personality, determinants, attributes and models, Leadership concepts and models, Values and attitudes, Motivation aspects, Change behavior

Time Management: Approaches of time management, their strengths and weaknesses. Time management matrix and the urgency addiction

Text Books:
1. Vasant Desai, "Dynamics of Entrepreneurial Development and Management", Himalaya Publishing House, 1997.
2. Prasanna Chandra, "Project-Planning, Analysis, Selection, Implementation and Review", Tata Mcgraw-Hill Publishing Company Ltd. 1995.
3. S.S. Khanka, "Entrepreneurial Development", S. Chand & Co. Pvt. Ltd., New Delhi

Suggested Reading:
1. Robert D. Hisrich, Michael P. Peters, "Entrepreneurship", 5/e, Tata Me Graw Hill Publishing Company Ltd., 2005.
2. Stephen R. Covey and A. Roger Merrill, "First Things First", Simon and Schuster Publication, 1994.
3. Sudha G.S., "Organizational Behavior", National Publishing House, 1996.

16ME O03

HUMAN RIGHTS AND LEGISLATURE PROCEDURES
(Open Elective - II)

Instruction	3L Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To help students
1. To understand the value of human rights
2. To understand the Lawful rights available to him and others
3. To create understanding the rights of under privileged and respect them
4. To understand role of an individual in the Civil Society
5. To understand the safety aspects while using technology and to understand the role of NGO's in protecting human rights and environment.

Course Outcomes: At the end of the course student
1. will understand the process of evolution of human rights
2. Will understand constitutional protection available
3. Will understand the conditions of under privileged persons and will adopt a positive attitude towards.
4. Will understand the role of Law in protecting environment and will recognize right to life.
5. Will understand the safe means of using advanced technology and become part of NGO's in protecting human rights and environment.

UNIT–I

Meaning and Concept of Human Rights: Notion and classification of Rights, Moral and Legal Rights, Three generations of rights (Civil, and Political Rights, Economic Social and Cultural Rights, Collective/Solidarity Rights), Indian Bill of Rights and Sarodaya, Preamble of Indian Constitution, Fundamental Rights-Directive Principles-Fundamental Duties

UNIT–II

Human Rights Enforcement Mechanism: Human Rights Act, 1993, Judicial organs-Supreme Court (Art 32) and High Court (Art 226), Human Rights

Commission, National and State Commission of Women/Children/Minority/SC/ST

UNIT–II

A Right to Development: Socio-Economic and Cultural Effects of Globalization, Right to Education, Transparency in Governance and Right to Information, Consumer Protection act.

UNIT–IV

Environment Rights Such as Right to Clean Environment and Public Safety: Issues of Industrial Pollution, Prevention, and Rehabilitation, Safety aspects of New Technologies such as Chemical and Nuclear Technologies, Issues of Waste Disposal, Protection of Environment.

UNIT–V

Role of Advocacy Groups: (a) Professional bodies: Press, media role of Lawyers – Legal Aid., (b) Educational Institutions (c) Role of Corporate Sector   (d) N.GOs

Text Books:
1. Mr. Ishay, "The history of Human rights", Orient Longman, New Delhi, 2004.
2. S.N. Chaudhary, "Human Rights and Poverty in India: Theoretical Issues", Delhi: Concepts, 2005.
3. Anuradha Kumar, "Encyclopedia of Human Rights Development of under Privilege", New Delhi: Sarup, 2002.

Suggested Reading:
1. Venket Iyer, (ed.), Democracy, "Human Rights and the Rule of Law: Essays in Honour of Nani Palkhivala", New Delhi: Butterworth's, 2000.
2. R.J. Cook and C.G. Ngwena (ed.), "Health and Human Rights", OUP, Clarendon, 2007.
3. UNESCO, "Ethics of Science and Technology: Explorations of the Frontiers of Science and Ethics", OUP, Clarendon, 2006.

16CE O02

DISASTER MITIGATION AND MANAGEMENT
(Open Elective - II)

Instruction	3L Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To enable the student
1. To equip the students with the basic knowledge of hazards, disasters, risks and vulnerabilities including natural, climatic and human induced factors and associated impacts
2. To impart knowledge in students about the nature, causes, consequences and mitigation measures of the various natural disasters
3. To enable the students to understand risks, vulnerabilities and human errors associated with human induced disasters
4. To enable the students to understand and assimilate the impacts of any disaster on the affected area depending on its position/ location, environmental conditions, demographic, etc.
5. To equip the students with the knowledge of the chronological phases ina disaster management cycle and to create awareness about the disaster management framework and legislations in the context of national and global conventions

Course Outcomes: After successful completion of the course, student will be able to
1. Ability to analyse and critically examine existing programs in disaster management regarding vulnerability, risk and capacity at different levels
2. Ability to understand and choose the appropriate activities and tools and set up priorities to build a coherent and adapted disaster management plan
3. Ability to understand various mechanisms and consequences of human induced disasters for the participatory role of engineers in disaster management
4. To understand the impact on various elements affected by the disaster and to suggest and apply appropriate measures for the same

5.   Develop an awareness of the chronological phases of disaster preparedness, response and relief operations for formulating effective disaster management plans and ability to understand various participatory approaches/strategies and their application in disaster management

UNIT-I

Introduction: Basic definitions- Hazard, Disaster, Vulnerability, Risk, Resilience, Mitigation, Management; classification of types of disaster- Natural and man-made; International Decade for natural disaster reduction (IDNDR); International strategy for disaster reduction (ISDR), National disaster management authority (NDMA).

UNIT-II

Natural Disasters: Hydro meteorological disasters: Causes, Early warning systems- monitoring and management, structural and non-structural measures for floods, drought and Tropical cyclones; Geographical based disasters: Tsunami generation, causes, zoning, Early warning systems- monitoring and management, structural and non-structural mitigation measures for earthquakes, tsunami, landslides, avalanches and forest fires. Case studies related to various hydro meteorological and geographical based disasters.

UNIT-III

Human induced hazards: Chemical disaster- Causes, impacts and mitigation measures for chemical accidents, Risks and control measures in a chemical industry, chemical disaster management; Case studies related to various chemical industrial hazards eg: Bhopal gas tragedy; Management of chemical terrorism disasters and biological disasters; Radiological Emergencies and case studies; Case studies related to major power break downs, fire accidents, traffic accidents, oil spills and stampedes, disasters due to double cellar construction in multi-storeyed buildings.

UNIT-IV

Disaster Impacts: Disaster impacts- environmental, physical, social, ecological, economical, political, etc.; health, psycho-social issues; demographic aspects-gender, age, special needs; hazard locations; global and national disaster trends; climate change and urban disasters.

UNIT-V

Concept of Disaster Management: Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; risk analysis,

vulnerability and capacity assessment; Post-disaster environmental response-water, sanitation, food safety, waste management, disease control; Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

Text Books:

1.   Pradeep Sahni," Disaster Risk Reduction in South Asia", Prentice Hall, 2003.
2.   B. K. Singh," Handbook of Disaster Management: techniques & Guidelines", Rajat Publication, 2008.

Suggested Reading:

1.   Ministry of Home Affairs". Government of India, "National disaster management plan, Part I and II",
2.   K. K. Ghosh," Disaster Management", APH Publishing Corporation, 2006.
3.   Hazards, Disasters and your community: A booklet for students and the community, Ministry of home affairs.

Web Resources:

1.   http://www.indiaenvironmentportal.org.in/files/filedisaster_management_india1.pdf
2.   http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs)

16EG O02

GENDER SENSITIZATION
(Open Elective - II)

Instruction	3L Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course will introduce the students to:
1. To develop students' sensibility with regard to issues of gender in contemporaryIndia.
2. To provide a critical perspective on the socialization of men and women.
3. To expose the students to debates on the politics and economics of work. To help students reflect critically on gender violence.

Course Outcomes : After successful completion of the course the students will be able to:
1. Develop a better understanding of important issues related to what gender is in contemporary India.
2. Be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived fromresearch, facts, everyday life, literature, and film.
3. Attain a finer grasp of how gender discrimination works in our society and how to counter it. Students will acquire insight into the gendered division of labour and its relation to politics and economics.
4. Understand what constitutes sexual harassment and domestic violence and be made aware of New forums of Justice.
5. Draw solutions as to how men and women, students and professionals can be better equipped to work and live together as equals.

UNIT – I
Understanding Gender:
Gender: Why Should We Study It? (*Towards a World of Equals*: Unit -1)
Socialization: Making Women, Making Men (*Towards a World of Equals*: Unit -2)
Introduction.Preparing for Womanhood.Growing up Male.First lessons in Caste. Different Masculinities.

UNIT – II
Gender And Biology:
Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4)
Declining Sex Ratio.Demographic Consequences.
Gender Spectrum: Beyond the Binary (*Towards a World of Equals*: Unit -10)
Two or Many?Struggles with Discrimination.

UNIT–III
Gender andLabour:
Housework: the Invisible Labour (*Towards a World of Equals*: Unit -3)
"My Mother doesn't Work." "Share the Load."
Women's Work: Its Politics and Economics (*Towards a World of Equals*: Unit - 7)
Fact and Fiction.Unrecognized and Unaccounted work. Additional Reading: Wages and
Conditions of Work.

UNIT–V
Issues Of Violence
Sexual Harassment: Say No! (*Towards a World of Equals*: Unit -6)
Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading:
"*Chupulu*".

Domestic Violence: Speaking Out (*Towards a World of Equals*: Unit -8)
Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading:
New Forums for Justice.
Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11)
Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of
Violence.

UNIT–V
Gender: Co - Existence
Just Relationships: Being Together as Equals (*Towards a World of Equals*: Unit -12)
Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers.
Additional Reading: Rosa Parks-The Brave Heart.

Text Book:
1. Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote,VasudhaNagaraj, AsmaRasheed, GoguShyamala, DeepaSreenivas and Susie Tharu "Towards a World of Equals: A Bilingual Textbook on Gender" published by Telugu Akademi, Hyderabad, Telangana State, 2015.

Suggested Reading:
1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012.

Web Resources:
1. Abdulali Sohaila. "I Fought For My Life…and Won." http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/
2. https://aifs.gov.au/publications/gender-equality-and-violence-against-women/introduction
3. https://theconversation.com/achieving-gender-equality-in-india

Note: Since it is an Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

16IT C38

SEMINAR

Instruction	3Hours per week
CIE	50 Marks
Credits	2

The goal of a seminar is to introduce students to critical reading, understanding, summarizing, explaining and preparing report on state of the art topics in a broad area of his/her specialization. Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.

The seminar must be clearly structured and the power point presentation shall include following aspects:
1. Introduction to the field
2. Literature survey
3. Consolidation of available information
4. Summaryand Conclusions
5. References

Each student is required to:
1. Submit a one page synopsis of the seminar talk for display on the notice board.
2. Deliver the seminar for a maximum duration of 30 minutes, where the presentation should be for 20 minutes in PowerPoint, followed by Question and Answers session for 10 minutes.
3. Submit the detailed report of the seminar in spiral bound in a précised format as suggested by the department.

Seminars are to be scheduled from 3rd week to the last week of the semester and any change in schedule shall be discouraged.

For the award of sessional marks students are judged by three (3) faculty members and are based on oral and written presentations as well as their involvement in the discussions during the oral presentation.

Note: Topic of the seminar shall preferably be from any peer reviewed recent journal publications.

	Guidelines for awarding marks	
Sl No.	Description	Max Marks
1.	Contents and relevance	10
2.	Presentation skills	10
3.	Preparation of PPT slides	05
4.	Questions and answers	05
5.	Report in a prescribed format	20

16IT C39

PROJECT

Instruction	6 Hours per week
CIE	50 Marks
SEE	100 Marks
Credits	6

The object of Project is to enable the student extend further the investigative study, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

1. In depth study of the topic assigned
2. Review and finalization of the Approach to the Problem relating to the assigned topic
3. Preparing an Action Plan for conducting the investigation, including team work
4. Detailed Analysis/Modelling/Simulation/Design/Problem Solving/ Experiment as needed
5. Final development of product/process, testing, results, conclusions and future directions
6. Preparing a paper for Conference presentation/ Publication in Journals, if possible
7. Preparing a Dissertation in the standard format for being evaluated by the Department
8. Final Seminar presentation before Departmental Committee

Guidelines for the award of marks in CIE: (Max. Marks: 50)

Evaluation by	Max .Marks	Evaluation Criteria / Parameter
Department Review Committee	05	Review 1
	08	Review 2
	12	Submission
Supervisor	05	Regularity and Punctuality
	05	Work Progress
	05	Quality of the work which may lead to publications
	05	Report Preparation
	05	Analytical / Programming / Experimental Skills

Guidelines for awarding marks in SEE: (Max. Marks: 100)

Evaluation by	Max .Marks	Evaluation Criteria / Parameter
External and Internal Examiners together	20	Power Point Presentation
	40	Thesis Evaluation
	20	Quality of the project ● Innovations ● Applications ● Live Research Projects ● Scope for future study ● Application to society
	20	Viva-Voce

16IT O01

OBJECT ORIENTED PROGRAMMING USING JAVA
(Open Elective)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To familiarize with fundamentals of object-oriented programming paradigm.
2. To impart the knowledge of string handling, interfaces, packages and inner classes.
3. To facilitate learning Exception handling and Multithreading mechanisms.
4. To gain knowledge on collection framework, stream classes.
5. To familiarize with event driven GUI programming and Database connectivity.

Course Outcomes: Upon completing this course, students will be able to:
1. Understand Object-Oriented concepts.
2. Create Java applications using sound OOP practices e.g. Inheritance, Interfaces, Packages, and Inner Classes.
3. Implement Exception Handling and Multithreading concepts in java programs.
4. Develop programs using the Java CollectionAPI and Stream classes.
5. Design and Develop GUI applications with the integration of event handling, JDBC.

UNIT–I
OOP concepts - Data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism, classes and objects, Procedural and object oriented programming paradigms.
Introduction to Java: Java's Magic: The Byte code, The Java Buzzwords, Simple Java Programs, Java Primitive Types, Arrays: How to create and define arrays, Basic Operators, Control statements.
Introducing Classes: Declaring objects, methods, Constructors, this keyword, Method Overloading and Constructor Overloading, Objects as parameters, Returning objects, Use of static and final keywords.

UNIT–II

Inheritance: super and subclasses,Member access rules ,super keyword**,** Method overriding, Dynamic method dispatch , Abstract classes, using final with inheritance , Introduction to Object class.

Packages: Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages.

Interfaces : Defining and implementing interfaces, Nested Interfaces.

Strings Handling: String & StringBuffer classes, StringTokenizer class and Wrapper classes and conversion between Objects and primitives.

Inner classes in Java: Types of inner classes, Creating static / non-static inner classes, Local and anonymous inner classes.

UNIT–III

Exception Handling in Java: what areExceptions? Exception types**,** Usage of try, catch, throw, throws and finally clauses, writing your own exception classes.

Multithreading in Java: The java Thread Model, How to create threads, Thread class in java, Thread priorities, Thread synchronization.

Generics: What are Generics? Generic classes, bounded types, Generic methods and interfaces.

UNIT–IV

Collections Framework: Overview of Collection Framework, Commonly used Collection classes – ArrayList, LinkedList, HashSet, LinkedHashSet, TreeSet, Collection Interfaces –Collection, List, Set, SortedSet, Accessing a collection via an Iteration,Storing user-defined classes in collections, Map Interfaces and Classes, Using a comparator. Legacy classes – Vector, Hashtable, The Enumeration interface.

Input/Output : How to read user input (from keyboard) using scanner class,Stream classes, InputStream, OutputStream, FileInputStream, FileOutputStream, Reader and Writer, FileReader, FileWriter cl asses. File class.

UNIT–V

GUI Design and Event Handling: Component, Container, window, Frame classes. Working with Frame window GUI Controls, Layout Managers, Introduction to Swings, Delegation Event Model, Event Classes, Source of Events, Event Listener Interfaces, Handling button click events, Adapter classes.Writing GUI Based applications.

Database Handling in Java: Java Database Connectivity (JDBC) using MySQL.

Text Books:
1. Herbert Schildt, "Java: The Complete Reference", 8th Edition, Tata McGraw Hill Publications, 2011.
2. Cay S. Horstmann, Gary Cornell, "Core Java, Volume I, Fundamentals", 8th Edition, Prentice Hall, 2008.

Suggested Reading:
1. Sachin Malhotra & Saurabh Choudhary, "Programming in Java", 2nd Edition, Oxford University Press, 2014.
2. C. Thomas Wu, "An introduction to Object-oriented programming with Java", 4th Edition, Tata McGraw-Hill Publishing company Ltd., 2010.
3. Kathy Sierra, Bert Bates, "Head First Java: A Brain-Friendly Guide" 2nd Edition, O'Reilly,2005

Web Resources:
1. https://www.cse.iitb.ac.in/~nlp-ai/javalect_august2004.html.
2. http://nptel.ac.in/courses/106106147/
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-092-introduction-to-programming-in-java-january-iap-2010/lecture-notes/

16IT O02

PRINCIPLES OF INTERNET OF THINGS
(Open Elective)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
1. To provide an overview of Internet of Things, building blocks of IoT and real-world applications.
2. To explore various IOT enabling technologies.
3. To facilitate students, understand Python scripts for IoT platform.
4. To identify steps in IOT design Methodology.
5. To introduce about the Raspberry Pi device, its interfaces and Django Framework.

Course Outcomes: Upon completing this course, students will be able to:
1. Comprehend the terminology, protocols and communication models of IoT.
2. Define the various IoT enabling technologies and differentiate between M2M and IoT.
3. Acquire the basics of Python Scripting Language used in developing IoT applications.
4. Describe the steps involved in IoT system design methodology.
5. Design simple IoT systems using Raspberry Pi board and interfacing sensors with Raspberry Pi.

UNIT – II
Introduction & Concepts: Introduction to Internet of Things- Definitions & Characteristics ofIoT, Physical Design of IOT-Physical Layer, Network Layer, Transport Layer, Application Layer, Things in IoT, IoT Protocols, Logical Design of IOT-IoTFunctional Blocks, IoT Communication Models-Request-reponse,Publisher-Subscriber, Push-Pull, Exclusive Pair, IoT Communication APIs-REST API, Websocket API,

UNIT – II
IOT Enabling Technologies: Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems, IOT Levels & Deployment Templates. Differences and similarities between IOT and M2M, Domain Specific IoT's – IoT applications for Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.

UNIT – III
Introduction to Python–Motivation for using Python for designing IoT systems, Language features of Python, Data types- Numbers, Strings, Lists, Tuples, Dictionaries, Type Conversions, Data Structures: Control of flow-if, for, while, range, break/continue, pass, functions, modules, packaging, file handling, data/time operations, classes, Exception handling,

UNIT – IV
IoT Platforms Design Methodology: Introduction, IoT Design Methodology Steps-Purpose and Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specifications, IoT Level Specification, Functional View Specification, Operational View Specification, Device and Component Integration, Application Development, Case Study on IoT System for Weather Monitoring.

UNIT –V
IoT Physical Devices and End Points: Basic building blocks of an IoT device, Raspberry Pi about the Raspberry Pi board, Raspberry Pi interfaces-Serial, SPI, I2C, Other IoT Devices pcDuino, BeagleBone Black, Cubieboard. Python Web Application Framework: Django Framework-Roles of Model, Template andView

Text Books:
1. Arshdeep Bahga and Vijay Madisetti, "Internet of Things - A Hands-on Approach, Universities Press, 2015.
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014.

Suggested Reading:
1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.

2.   Francis da Costa, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.
3.   Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", Willy Publications.

Web Resources:
1.   The Internet of Things - Article
      https://dl.acm.org/citation.cfm?id=1862541
2.   Internet of Things - Tutorial
3.   http://archive.eurescom.eu/~pub/about-eurescoiem
      message_2009_02/Eurescom_message_02_2009.pdf
4.   Publications on The Internet of Things.
      http://www.itu.int/osg/spu/publications/internetofthings
      InternetofThings_summary.pdf